

ABSTRACT OF THE DISCLOSURE

A system and method of obtaining serial biochemical, anatomical or physiological in vivo measurements of disease from one or more medical images of a patient before, during and after treatment, and measuring extent and severity of the disease is provided. First anatomical and functional image data sets are acquired, and form a first co-registered composite image data set. At least a volume of interest (ROI) within the first co-registered composite image data set is identified. The first co-registered composite image data set including the ROI is qualitatively and quantitatively analyzed to determine extent and severity of the disease. Second anatomical and functional image data sets are acquired, and form a second co-registered composite image data set. A global, rigid registration is performed on the first and second anatomical image data sets, such that the first and second functional image data sets are also globally registered. At least a ROI within the globally registered image data set using the identified ROI within the first co-registered composite image data set is identified. A local, non-rigid registration is performed on the ROI within the first co-registered composite image data set and the ROI within the globally registered image data set, thereby producing a first co-registered serial image data set. The first co-registered serial image data set including the ROIs is qualitatively and quantitatively analyzed to determine severity of the disease and/or response to treatment of the patient.